

CLAIMS

1. Method for hair treatment, wherein
an active ingredient composition is applied to the hair,
wherein the active ingredient composition

(A) contains at least a first active ingredient or first active ingredient complex, selected from or formed of substances which, either alone or in combination with other substances, can provide a shape memory effect after being applied to the hair and after the performance of the treatment of the hair described in the following, and wherein the active ingredient composition

(B) contains at least a second active ingredient, which is selected from the hydrophobic substances with a water solubility of ≤ 5 percent by weight at 20° C;

the hair is arranged in a given shape (permanent memory shape) before, simultaneously with or after the application of the active ingredient composition and

the memory shape is subsequently fixed by inducing a chemical or physical modification of the applied active ingredients;

wherein after a wanted or unwanted deformation of the memory shape, the original memory shape can essentially be restored by means of a physical stimulation.

2. Method according to Claim 1, characterised in that at least two substances are contained in the active ingredient composition, said substances having no or only weak shape memory characteristics individually, and said substances giving a synergistically increased shape memory effect to the hair when applied together according to the method according to Claim 1.

3. Method according to Claim 1, wherein
the first active ingredient is a cross-linkable macromer, which forms a shape memory polymer after cross-linking, wherein the macromer

a) contains cross-linkable regions that are cross-linkable through chemical bonds and

b) contains thermoplastic regions that are not chemically cross-linkable,

the memory shape is fixed by chemically cross-linking the macromer while forming the shape memory polymer,
and

wherein the shape memory polymer has at least one transition temperature T_{trans} .

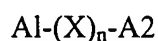
4. Method for hair treatment, wherein

a. hairstyle (permanent shape) programmed by means of a method according to Claim 3 is heated to a temperature higher than T_{trans} ,

the hair is brought into a second (temporary) shape and

the second shape is fixed by means of cooling to a temperature below T_{trans} .

5. Method according to Claim 3 or 4, characterised in that the cross-linkable macromer is selected from compounds with the general formula



wherein A1 and A2 represent reactive, chemically cross-linkable groups and $-(X)_n-$ represents a divalent, thermoplastic polymer or oligomer segment.

6. Method according to Claim 5, characterised in that the cross-linkable macromer is selected from polyesters, oligoesters, polyalkylene glycols, oligoalkylene glycols, polyalkylene carbonates and oligoalkylene carbonates, substituted with at least two acrylate groups or methacrylate groups.

7. Method according to Claim 6, characterised in that the cross-linkable macromer is selected from poly(ϵ -caprolactone)-dimethacrylate, poly(DL-lactide)-dimethacrylate, poly(L-lactide-co-glycolide)-dimethacrylate, poly(ethylene glycol)-dimethacrylate, poly(propylene glycol)-dimethacrylate, PEG-block-PPG-block-PEG-dimethacrylate, poly(ethylene adipate)-dimethacrylate, hexamethylene carbonate dimethacrylate.

8. Method according to one of the preceding claims, characterised in that the composition additionally contains a macromer with only one terminal or side chemically reactive group.

9. Method according to Claim 1, wherein
the first active ingredient is a shape memory polymer that
a) has at least one hard segment that can be cross-linked by means of physical interaction, said hard segment having a first transition temperature T'_{trans} , which is above room temperature, and
b) has at least one soft segment with a second transition temperature T_{trans} , which is lower than T'_{trans} and
the memory shape is fixed by physical cross-linking of the shape memory polymers.

10. Method according to Claim 9, characterised in that the shaping of the hair occurs under heating to a temperature of at least T'_{trans} and that the subsequent fixing of the shape of the hair is achieved by means of cooling to a temperature below T'_{trans} .

11. Method for hair treatment, wherein
a hairstyle (permanent shape) programmed by a method according to Claim 9 or 10 is heated to a temperature between T'_{trans} and T_{trans} ,
the hair is brought into a second (temporary) shape and

the second shape is fixed by means of cooling to a temperature below T_{trans} .

12. Method for reprogramming a hairstyle (permanent shape) previously programmed by means of a method according to Claim 9 into a new permanent shape, wherein the hairstyle is heated to a temperature above T'_{trans} is brought into a new shape and the new shape is subsequently fixed by means of cooling to a temperature below T'_{trans} .

13. Method according to one of the Claims 9 to 12, characterised in that the shape memory polymer has a degree of crystallinity of from 3 to 80% and that the ratio of the moduli of elasticity below and above T_{trans} is at least 20.

14. Method according to one of the Claims 9 to 13, characterised in that the shape memory polymer is a copolyester urethane.

15. Method according to Claim 14, characterised in that the shape memory polymer is the reaction product of (a) two different macrodiols, selected from α , ω -dihydroxy polyesters, α , ω -dihydroxy oligoesters, α , ω -dihydroxy polylactones and α , ω -dihydroxy oligolactones, and (b) at least one diisocyanate.

16. Method for the recovery of a hairstyle (permanent shape) previously programmed by means of a method according to Claim 1, 3, 9 or 12, wherein a hairstyle in a temporary shape according to Claim 4 or Claim 11 or a hairstyle deformed by means of cold forming is heated to a temperature above T_{trans} .

17. Method according to one of the preceding claims, characterised in that the hydrophobic, second active ingredient is selected from dimerdiol, dimerdiol oligoethers,

oligoester diols, dimer acid, PMS divinyl ether, hydrophobic polymers, hydrophobic tensides with HLB levels ≤ 7 , silicone compounds, organic oils, fats, waxes, glyceryl esters, fatty acid esters, fatty alcohol esters.

18. Method according to Claim 17, characterised in that the hydrophobic polymer is selected from polymers that contain at least one type of monomer, which is selected from acrylic acid alkyl esters and methacrylic acid alkyl esters, wherein the alkyl groups have at least 6 C atoms.

19. Method according to Claim 17, characterised in that the silicone compounds are selected from dimethylpolysiloxanes and dimethylsiloxane / alkylmethylsiloxane copolymers, wherein the alkyl groups have at least 6 C atoms.

20. Method according to one of the preceding claims, characterised in that the active ingredient composition contains the first active ingredient in an amount of 0.01 to 25 percent by weight and the second active ingredient in an amount of 0.01 to 25 percent by weight.

21. Method according to one of the preceding claims, characterised in that the active ingredient composition is present as a solution and contains water and at least one organic solvent.

22. Method according to Claim 21, characterised in that the organic solvents are selected from ethanol, isopropanol, n-propanol and acetone.

23. Hair cosmetic composition containing an active ingredient complex in a suitable cosmetic foundation, wherein the active ingredient complex

(A) contains at least a first active ingredient which is selected from substances which, alone or in combination with other substances, can provide a shape memory

effect to the hair after being applied to the hair and after the performance of a method according to one of the Claims 1 to 20, and

(B) contains at least a second active ingredient, which is selected from hydrophobic substances with a water solubility of ≤ 5 percent by weight at 20° C.

24. Composition according to Claim 23, characterised in that the first active ingredient (A) is either a macromer that can be cross-linked into a shape memory polymer, wherein the cross-linked shape memory polymer has at least one transition temperature T_{trans} and wherein the macromer

a) contains cross-linkable regions that are cross-linkable through chemical bonds and

b) contains thermoplastic regions that are not chemically cross-linkable;

and / or that the first active ingredient is a shape memory polymer that

a) has at least one hard segment that can be cross-linked by means of physical interaction, said hard segment having a first transition temperature T'_{trans} , which is above room temperature, and

b) has at least one soft segment with a second transition temperature T_{trans} , which is less than T'_{trans} ;

and the second active ingredient (B) is selected from dimerdiols, dimerdiol oligoethers, oligoester diols, dimer fatty acids, PMS-divinyl ethers, hydrophobic polymers, hydrophobic tensides with HLB levels ≤ 7 , silicone compounds, organic oils, fats and waxes; wherein the weight ratio of (A) : (B) is from 1:1 to 2.5:1.

25. Composition according to Claim 24, characterised in that the hydrophobic polymer is selected from polymers that contain at least one type of monomer, which is selected from acrylic acid alkyl esters and methacrylic acid alkyl esters, wherein the alkyl groups have at least 6 C atoms.

26. Composition according to Claim 24, characterised in that the silicone compounds are selected from dimethylpolysiloxanes and dimethylsiloxane / alkylmethylsiloxane copolymers, wherein the alkyl groups have at least 6 C atoms.

27. Composition according to one of the Claims 23 to 26, characterised in that the shape memory polymer is contained at 0.01 to 25% percent by weight and the hydrophobic active ingredient in an amount of from 0.01 to 25 percent by weight.

28. Composition according to one of the Claims 23 to 27, characterised in that at least two substances are contained, said substances having no or only weak shape memory characteristics individually and said substances giving a synergistically increased shape memory effect to the hair when applied together according to the method according to Claim 1.

29. Cosmetic substance containing a composition according to one of the Claims 23 to 28, characterised in that it is present in the form of a lotion, a spray lotion, a cream, a gel, a foam-gel, an aerosol spray, a non-aerosol spray, an aerosol foam, a non-aerosol foam, an o/w or a w/o emulsion, a micro-emulsion or a hair wax.

30. Substance according to Claim 29, characterised in that an additional 0.01 to 25 percent by weight of at least one active ingredient is contained, said active ingredient being selected from hair-care substances, hair-fixing substances and hair-colouring substances.